QUICK REFERENCE GUIDE

520B3

UNIVERSAL TEST SYSTEM

General Instructions

The 520B incorporates a LEVEL IN control which should always be adjusted such that the test tone signal is displayed as 0 dB. This "normalizes" the level detecting circuits and makes it possible to reference noise readings directly to 0 TLP. The noise reference is shifted from the LEVEL IN set ting to 0 TLP by introducing attenuation equal to the difference between TLP and actual test tone level (normally 13 dB) by means of a front panel switch.

NOTE: The standard data level test tone is 13 dB below TLP (-13 dBm0).

The LOCK frequency function uses 1004 Hz as a base. This may be changed to 100 Hz by means of a slide switch on the motherboard of the 520B.

Check:

a) LEVEL controls at -00
b) TRANSMIT FUNCTION in NORM
c) DISPLAY OFFSET in CAL
d) Receiver TERM
e) MAN tune

Hit Measurements

Line transients are measured with a 1004 Hz holding tone present. A drop-out will inhibit all other counters and a gain or phase hit will inhibit an impulse count.

1. Select HIT MEASUREMENTS and set LEVEL OUT at test level, -13 dBm0.
2. Set LEVEL IN to a receive level, i.e., such that 0 dB is displayed when in AMPLITUDE RESPONSE (GAIN) mode.
3. Select RCV frequency display.
4. Set thresholds:

Gain	±1 to 6 dB
0	10 to 45
Impulse	40 to 99 dBrnc0

5. Select TIME period.
6. Operate START pushbutton switch to clear registers and start timing.
7. When timed cycle is completed, sequentially read hit registers.

Check:

a) Circuit impedance
b) Termination
c) Transmit function on NORM
d) C-MSG filter selected
e) NOISE/TLP up (dBrn0 or ON)

Two-Wire Testing

Dial & Hold

1 Connect 2-WIRE line to TRANSMIT jack (T/

2 Select DIAL on Transmit Function switch.

3 Connect dialset to DIAL jack (T/R),

4 Dial test line or other number.

5 Select HOLD when call is completed.

6 To connect receiver line without dropping the call, switch Transmit Function to XFR.

7 Call will be released when Function switch is placed in NORM position.

8 Test procedures are the same as for 4-WIRE lines, except they can be made only in one direction at a time.

Envelope Delay

Refer to ENVELOPE DELAY section and complete Items 1 through 3.

1 Set SYNCH of transmitting instrument to mid position.

2 Adjust SYNCH of receive instrument to stop or minimize drift in delay reading.

3 Measure delay in normal fashion.

4 Check drift at reference frequency.

Notched Noise (Noise-with-Tone)

A 1004 Hz holding tone at data level (-13 dBm0) is transmitted. This tone is notched out in the receiver and the circuit noise is weighted by the selected filter, C-MSG or 3 kHz.

1. Select NOISE. Set LEVEL OUT to test tone level.
2. Set LEVEL IN to receive tone level.
3. Place NOISE/TLP CORRECTION switch up (dBrn0 or ON). This corrects the noise reference to TLP rather than to test level.
4. Read noise-with-tone directly in dBrn-0.
5. Operate S/N switch and read tone level in dBrn-0.
6. Subtract noise-with-tone reading from tone level to obtain S/N in dB.
7. Monitor circuit with speaker to detect tone interference.

NOTE: To read noise in dBrn (uncorrected), set LEVEL IN to 00 and NOISE/TLP CORRECTION switch down (dBrn or OFF). Receive signal must not exceed +3 dBm.

Check:
- a) Circuit impedance
- b) Termination
- c) Transmit function on NORM
- d) Display in CAL position
- e) Correct noise filter selected

Idle Circuit Noise

The transmit side of the line must be correctly terminated. Background noise is measured through the selected shaping filter.

1 The QUIET position provides a quiet transmit termination, regardless of which transmit LED may be illuminated.
2 Select NOISE.
3 Set LEVEL IN to test level.
4 Place NOISE/TLP CORRECTION switch up (dBrn0 or ON).
5 Read idle noise directly in dBrn-0.
6 Monitor circuit with speaker to detect tone interference.

NOTE To read noise in dBrn (uncorrected), set LEVEL IN to 00 and NOISE/TLP CORRECTION switch down (dBrn or OFF).

Check:
a) Circuit impedance
b) Termination
c) Transmit function on QUIET
d) Display in CAL position
e) Correct noise filter selected

Phase Jitter

Peak-to-peak phase jitter is measured using a 1004 Hz holding tone transmitted at data level

Select Ø JITTER. The 1004 transmit LED will light.

Set LEVEL OUT and LEVEL IN control to test level.

3 Set STD/STD & LF in STD position.

4 Read peak-to-peak jitter in degrees.

5 Set STD/STD & LF in STD & LF position.

6 Read peak-to-peak jitter in degrees.

NOTE A higher reading in the STD & LF position indicates that low frequency phase jitter is present.

Check:

a) Circuit impedance
b) Termination
c) Transmit function on NORM

Nonlinear Distortion

Two tone pairs are transmitted at data level (-13 dBm0). Second order distortion products, B « A and B+A are measured in two bands; third order 2B - A, in one band.

1 At the transmitting set, select NONLINEAR and adjust LEVEL OUT to test level. the 4-tone transmit LED will light.

2 At receiving set, select AMP RESP (GAIN) and adjust LEVEL IN for a display reading of 0 dBm.

3 Select NONLINEAR at receiving set.

4 Place band select switch in "2nd" and read second order distortion products.

5 Place switch in "3rd" and read third order products.

6 At transmitting set, operate S/N pushbutton switch to remove one tone pair.

Read noise in "2nd" and "3rd" slots at receiving set.

8 Correct distortion readings per chart.

DIFFERENCE (dB)	1	2	3	4 5	6-9
CORRECTION (dB)	7	5	3	2	1

Check:
a) Circuit impedance
b) Termination
c) Transmit function on NORM
d) Display in CAL position

Amplitude Response, End-to-End

Amplitude Response is measured by sweeping the oscillator frequency across the VF band, 300-3400 Hz, at a constant level and measuring the level at the receive end.

1. On far-end unit, select AMP RESP, and set LEVEL OUT to test level.
2. Using MAN sweep mode, tune oscillator to 1004 Hz.
3. With the far-end adjusted as above, set LEVEL IN on near-end unit, so that display reads 0 dB. Adjust DISPLAY OFFSET for a reading of 0.0 dB. Select RCV frequency display.
4. For a point to point reading, slowly tune transmitter across the band starting at 300 Hz. At receiver, read level deviation as each new frequency comes up.
5. To store response in memory scope, set 500B to LOAD mode. Set transmitting unit to CONT tuning and slow SGL sweep.
6. Reset DISPLAY OFFSET control to CAL position when test is completed.

Check:

a) Circuit impedance
b) Termination
c) Transmit function in NORM
d) SF skip tuning if required
e) LOCK tuning selected

Amplitude Response, Repeat Mode

Amplitude response of the remote instrument's forward line may be repeated back to the local instrument.

At local instrument, select AMP RESP (GAIN), and set LEVEL OUT to test level.

2 Using MAN sweep mode, tune oscillator to 1004 Hz.

3 Adjust LEVEL IN for a 0 dB reading. Set display switch to RCV.

4 At remote instrument, select REPEAT.

5 Sweep remote instrument frequency and read attenuation distortion of forward line.

Check:

a) Circuit impedance
b) Termination
c) Transmit function in NORM
d) SF skip tuning if required
e) LOCK tuning selected
f) C-MSG filter selected (if required 520B models)

Envelope Delay

Envelope delay is measured by transmitting a modulated carrier forward, repeating the modulation envelope back at the far-end, and comparing the phase of the returned signal with the original.

1 Set LEVEL OUT of both instruments to test level, and tune to 1004 Hz.

2 Adjust LEVEL IN for a 0 dB reading in AMPLITUDE RESPONSE (GAIN) mode.

3 Set local master instrument to DELAY mode, MAN sweep, and tune to 1800 Hz.

4 Set remote instrument to REPEAT mode, MAN sweep, and tune to 1800 Hz.

On local (measuring) unit, operate REF switch to zero set reading. Select appropriate DELAY DAMP (LO normal, HI for noisy line).

To measure forward line, sweep frequency of local unit. Use MAN tuning for point-by-point reading; slow SGL sweep for X-Y recording; slow AUTO sweep for scope storage. Observe XMT frequency on local unit.

7 To measure return line, sweep remote unit. Local unit remains at 1800 Hz and observes RCV frequency.

Check:

a) Circuit impedance
b) Termination
c) Transmit function
d) SF skip tuning if required
e) LOCK tuning selected
f) Modulation, 83⅓ Hz

Peak-to-Average Ratio

This measurement involves the generation and transmission of a precisely controlled, complex pulse train of known peak-to-average ratio.

1 At the transmitting set, select P/AR and adjust LEVEL OUT to test level. The 4-tone/ P/AR transmit LED will light.

2 At the receiving set, select P/AR.

Read and record P/AR value shown on the display.

Check:
a) Circuit impedance
b) Termination
c) Transmit function on NORM

Instrument Check Procedure

Operation of the instrument may be checked in the back-to-back mode. To do this, check control positions, loop receiver to transmitter, and procede as follows:

A LEVEL CHECK
Select AMP RESP (GAIN) mode.
Display should read 0.0 ±0.2 dB.

B NOISE CHECK
Select NOISE and place NOISE/TLP CORRECTION switch to dBrn (OFF) position. Display should read less than 40 dBrn. Operate S/N switch and read 90 ± 1 dBrn. Place CORRECTION switch to dBrn (ON) and observe a 13 ±2 dB drop in display reading.

C PHASE JITTER
Select Ø JITTER and read less than 0.3

D NONLINEAR DISTORTION
Select NONLINEAR and observe distinctive pattern of four-tones on sampling oscilloscope. Operate S/N switch and note that upper tone pair is removed.

E DELAY
Select DELAY, tune to 1800 Hz and operate REF switch. Sweep response across band from 500 to 3000 Hz and Check that response is flat within 20 usec.

F HIT MEASUREMENTS
Select HIT MEASUREMENTS and observe dropout register. Disconnect and reconnect patch cord and note count being registered.

Storage Scope

The CRT scope may be used to visually show: amplitude response, envelope delay, Signal Impairment Display. Amplitude response and envelope delay values may be stored in the dual-storage digital memory.

1 Select the active memory; A, B, or both.

2 The following functions are provided:

CLEAR	The selected memory is set to a reference state (lower line on graticule).
LOAD	The response being measured by the instrument is stored in the selected memory. A single, slow sweep should be used.
INPUT	The real-time input to the scope is displayed.
MEMORY	The response curve stored in the selected memory is displayed.
INPUT + MEMORY	Both the real-time scope input and the stored response curves are displayed.
DYNAMIC	The scope input is read into memory (LOAD mode) which is also displayed. On 520B2 and 520B3 models, both memories are displayed and the B memory is continuously updated when this mode is selected.

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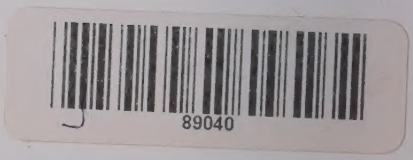

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